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(54) **SPECTRUM MEASURING DEVICE**

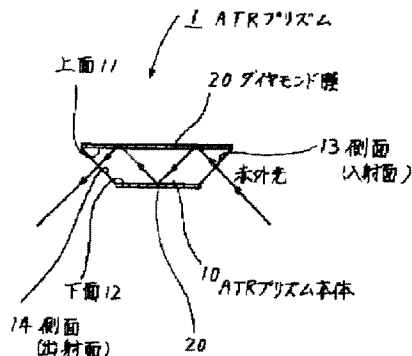
measured is smaller than the refractive index of the diamond film 20.

(57) Abstract:

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PURPOSE: To improve the properties such as temperature resistance, pressure resistance, abrasion resistance, corrosion resistance and the like by forming diamond films on the reflecting surfaces of an ATR(Attenuated Total Reflectance measurement) prism in contact with a sample.

CONSTITUTION: In an ATR prism, an ATR-prism main body 10 comprising a material, whose infrared transmittance is high, is used. The main body 10 has parallel upper surface 11 and lower surface 12 as the reflecting surfaces. A side surface 13, which is to become the incident surface, and a side surface 14, which is to become the outgoing surface, are cut out so as to form 45 degrees with respect to those surfaces. Diamond thin films 20 are formed on the upper surface 11 and the lower surface 12. The cutting angle of the incident surface is changed in correspondence with the refractive index of a sample to be measured and the refractive index of the main body 10, and the incident angle is changed into the adequate value. Thus, the condition of almost total reflection can be provided as long as the refractive index of the sample to be



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the spectrum measurement device used for structure measurement of a substance, especially on-line measurement of a process based on infrared rays or a near-infrared spectrum measurement principle in more detail about a spectrum measurement device.

[0002]

[Description of the Prior Art] The method of the spectrum analysis by the total-internal-reflection absorption measurement (henceforth ATR) which obtains the absorption spectrum of a specimen surface and performs substance measurement is known by measuring the light which carries out total internal reflection in a specimen surface.

[0003] As outline composition is shown in drawing 4, the condensing optical system using the reflector 61 etc. is used for the spectrum measurement device by ATR. A measuring beam is entered into the incidence side side 51 started by the predetermined angle of the plate-like ATR prism. After being repeatedly reflected between the parallel reflectors 52 and 53 of the ATR prism stuck to the device under test, the reflector 62 is used, and the outputted ray from the outgoing radiation side side 54 of an ATR prism is led to a detector, and is measured.

[0004]

[Problem(s) to be Solved by the Invention] It is important to choose the material of a suitable ATR prism in the above ATR measurement according to a device under test. It is as follows when the characteristic for which an ATR prism is asked is summarized.

- (1) Have transmissivity sufficient in the wavelength band used as a measuring object.
- (2) A refractive index is higher than a device under test.

Conventionally, out of various substances in which such optical properties differ, the ATR prism was chosen suitably and used. However, the demand about other character other than optical properties, such as ** -proof, pressure-proofing, stability, nontoxic, and abrasion resistance, is also increasingly imposed on an ATR prism as application of this device

spreads in the on-line measurement field of a process in recent years.

[0005]There is a diamond as a material in which character other than these optical properties was excellent with the optical property. However, a big crystal cannot obtain a diamond easily, it is expensive, dramatically more difficult still to process, and is not practical.

[0006]This invention solves the above technical problems and it aims at providing the spectrum measurement device using the ATR prism with which it not only satisfies an optical demand required for spectrum measurement, but it is satisfied of the demand about character other than optical properties, such as abrasion resistance, for example.

[0007]

[Means for Solving the Problem]A spectrum measurement device of this invention made in order that this invention might solve the above-mentioned problem, An entrance plane into which a measuring beam enters, at least one reflector in which said measuring beam is reflected by this specimen surface under test by being stuck to a device under test, A spectrum measurement device measured using an ATR prism which has an emission face to which a measuring beam after being reflected in a reflector is emitted is characterized by comprising:

A main part of an ATR prism which said ATR prism becomes from a single substance.

Diamond membrane formed in a reflector where it is stuck to a device under test.

Hereafter, it is explained how this spectrum measurement device acts.

[0008]

[Function]In the spectrum measurement device of this invention, the diamond membrane which is quality of a different thing is formed in the reflector where a sample is contacted to the main part of an ATR prism which consists of a single substance. Diamond membrane is excellent in heat resistance, resistance to pressure, abrasion resistance, etc.

By forming this thin film, these characteristics improve rather than the ATR prism made from the single substance.

[0009]In particular, a substance with high infrared ray transmission, for example, KBr, sapphire, etc. can be freely chosen now as a material of a prism body irrespective of the kind of sample, and the water resisting property and abrasion resistance which are faults when these substances are used for a prism body are improved. If ZeSe, KRS-5, etc. are taken for an example, the problem which cannot use the above-mentioned fault for on-line measurement of the toxicity of last ***** materials, therefore foodstuffs, etc., either is also solvable.

[0010]Since it can manufacture easily by thin film coating technology, such as CVD, without using the crystal of the diamond which expensive and is hard to process it, the problem of processing is also solved.

[0011]

[Example]Hereafter, the example of this invention is described using figures. Drawing 1

shows the sectional view of the ATR prism used for the spectrum measurement device in which one example of this invention is shown. The entire configuration of a spectrum measurement device is the same as that of a conventional example.

[0012]The main part 10 of an ATR prism which this ATR prism becomes from material with high infrared ray transmission is used. What is necessary is to just generally be used from the former as such a material. Suppose that sapphire is used in this example.

[0013]The ATR main part 10 has the parallel upper surface 11 and the undersurface 12 as a reflector, and it is started so that the side 14 used as the side 13 which turns into an entrance plane as shown in drawing 1, and an emission face may be 45 degrees to these fields. The diamond membrane 20 is formed in the upper surface 11 and the undersurface 12. This film can be made easy by the thin film coating technology of common knowledge of for example, an ECR plasma CVD method etc. When attaching a sample only to either the upper surface 11 or the undersurface 12, even if it will form diamond membrane only in the field, there is no trouble in particular.

[0014]What satisfied the total reflection condition when using such an ATR prism, or examined ** is shown in drawing 2. 2.38 or 1.7 refractive indices of diamond membrane and sapphire are carried out. Since the entrance plane is started by 45 degrees, an incidence angle is 45 degrees. Incident light serves as $1.7/2.38 = \sin a / \sin 45^\circ$ from the principle of HOIGENSU, and is $a = 30.3$ degrees. If the incidence in a sample from a diamond sets the refractive index of a sample to 1.1, it will be set to $2.38/1.1 = \sin x / \sin 30.3^\circ$, $\sin x = 1.08$, and the conditions of total internal reflection will be satisfied.

[0015]This example is only an example, and if the logging angle of an entrance plane is changed according to the refractive index of a device under test, and the refractive index of a prism body and an incidence angle is changed into a suitable value, as long as the refractive index of a device under test is smaller than the refractive index of diamond membrane, it can almost satisfy the conditions of total internal reflection.

[0016]The ATR prism which is an example of everything [drawing 3] but this invention is also a sectional view. In this example, the light source which excelled [light source] in the tracking of a semiconductor laser etc. is used. The main part 30 of an ATR prism is pillar-shaped, and the reflector 31 which is the end side is started by 45 degrees. On the other hand, the other end side which counters this started reflector 31 serves as the ON emission face 32. That is, it is a case where the entrance plane and the emission face are made to serve a double purpose in respect of the same. And the diamond membrane 33 is covered by the reflector 31 (the side between the ON emission face 32 and the reflector 31 may also be made to be covered with the thing of this example). This thing enters a laser beam vertically from the ON emission face 32, as shown in drawing 3, and after being reflected twice in the reflector 31, it is again emitted from the ON emission face 32. ATR measurement can be performed by becoming a probe-like ATR prism by using such shape, and contacting a device under test in the reflector 31 side.

[0017]

[Effect of the Invention]As mentioned above, as explained, diamond membrane was formed in the reflector where a sample is contacted in an ATR prism in this invention.

Therefore, improvement in fields, such as **-proof, pressure-proofing, abrasion resistance, and corrosion resistance, can be aimed at.

For example, also when measuring liquid samples, such as acid alkali, even if it is a main part substance of an ATR prism weak into these fluids, and a toxic substance, it becomes usable from an ATR main part stopping touching a liquid sample directly with diamond membrane. Therefore, the material whose measurement of such a liquid sample was not completed can also be used for an ATR prism.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1]An entrance plane characterized by comprising the following into which a measuring beam enters, at least one reflector in which said measuring beam is reflected by this specimen surface under test by being stuck to a device under test, A spectrum measurement device measured using an ATR prism which has an emission face to which a measuring beam after being reflected in a reflector is emitted.

A main part of an ATR prism which said ATR prism becomes from a single substance.

Diamond membrane formed in a reflector where it is stuck to a device under test.

[Translation done.]